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Amendment and Response

Applicant: Rory A. Heim et al.

Serial No.: 09/851,765

Filed: May 9, 2001

Docket No.: 10006454-1

Title: METHOD AND APPARATUS FOR COMPENSATING FOR INK CONTAINER EXTRACTION CHARACTERISTICS

REMARKS

This Amendment is responsive to the Office Action mailed December 27, 2001 in which claims 1, 2, 5-14 and 16-20 were rejected, and claims 3, 4, 15 and 21 were objected to. With this Response, claims 1, 3, 4, 6, 7, 9-17 and 19 have been amended. Claims 1-21 remain pending in the application and are presented for reconsideration and allowance.

The specification has been amended at pages 4, 5, 11, 13, 15 and 17-21 to rectify inadvertent errors in the specification. Applicant respectfully requests consideration and approval of these changes to the specification. Such consideration is respectfully requested.

Disclosure Objections

The Disclosure was objected to because the U.S. Patent Application number at page 17, line 28 was omitted. In response, the specification has been amended to include the application number. As such, Applicants believe that the objections to the Disclosure have been overcome and should be withdrawn. Such action is respectfully requested.

Claim Objections

Claim 6 was objected to because --which-- should be inserted after "ink usage" at line 2. In response, claim 6 has been amended as suggested by the Examiner. In light of this change, Applicants believe that the objection to claim 6 has been overcome and should be withdrawn. Such action is respectfully requested.

Claim Rejections under 35 U.S.C. § 112

Claims 1-15 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicants regard as the invention. In particular, claim 1 was rejected because it was said to be unclear if the control device was different from the ink extraction determining device. In response, these devices are different. As is made clear at page 6, lines 3-18 and page 20, line 13 through page 21, line 4 of the specification, the control device (29) is different than the ink extraction determining device (80). As such, changes to claim 1 to overcome the rejection based upon 35 U.S.C. § 112, second paragraph, are not believed to be necessary. Claim 9

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was rejected because it was said to be unclear if the control device was different from the monitoring device. As is made clear at page 21, lines 13-26 of the specification, the control device (29) is the same as the monitoring device (29). In response, the claims have been amended to more clearly set forth what is claimed. In light of these changes, Applicants believe that the rejection of the claims under 35 U.S.C. § 112, second paragraph, has been overcome and should be withdrawn. Such action is respectfully requested.

Claim Rejections under 35 U.S.C. § 102

Claims 1, 2, 5-14 and 16-20 were rejected under 35 U.S.C. § 102(e) as being anticipated by the U.S. Patent 6,155,664 to Cook. Cook in figure 1 is said to disclose an inkjet printing system configured for receiving a replaceable ink container 2. The replaceable ink container 2 is said to have ink extraction characteristics that vary with ink extraction. The inkjet printing system is said to include an ink extraction determining device (monitoring device) 36 for determining ink extracted from the ink container (90, 94), and a control device 36 that selects a print mode based on ink extraction characteristics of the ink container (92, print primary ink). The Examiner also detailed how Cook anticipates what is claimed in dependent claims 2, 5-8, 12 and 13.

Independent claim 1 has been amended and is now directed to an inkjet printing system configured for receiving a replaceable ink container having ink extraction characteristics that vary with ink extraction. The inkjet printing system comprises an ink extraction determining device for determining ink extracted from the replaceable ink container, and a control device for selecting a print mode from a plurality of different print modes based on ink extraction characteristics of the replaceable ink container.

By adjusting the print mode based upon ink extraction characteristics, ink can be more fully extracted from the replaceable ink container while preventing ink starvation during printing. Because more ink is extracted from the ink container, the ink container does not need to be replaced as often, thereby reducing the per page printing costs of the printing system and reducing waste. An inkjet printing system of this type is not taught, disclosed or anticipated by Cook.

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Cook in figure 1 is directed to an inkjet printing system that includes an inkjet printhead cartridge 2 having a printhead 24. The printhead cartridge 2 includes an integral primary ink reservoir 4 containing a first quantity of ink that is supplied to the printhead 24. The inkjet printing system further includes a remote ink cartridge 8 having a secondary ink reservoir 10 containing a second quantity of ink. The secondary ink reservoir 10 of the remote ink cartridge 8 is connected to the primary ink reservoir 4 of the inkjet printhead cartridge 2 via supply lines 6, 7 through a flow control device 1 (described with reference numeral 5 in the Cook specification). The printhead cartridge 2 and the remote ink cartridge 8 include memory devices 12 and 14 respectively, which are connected with the flow control device 1 to a controller 36 of the printing system. The controller 36 through ink drop count information from the memory devices 12, 14, or from ink level sensors 28a-28e, 30a-30b, determines the amount of ink in the primary and secondary reservoirs 4, 10 to determine when to open the flow control device 1 to refill the primary reservoir 4 from the secondary reservoir 10. If the ink level in the primary reservoir 4 is below a certain minimum threshold then the reservoir 4 is refilled from the reservoir 10. If the secondary reservoir 10 does not have enough ink to refill the primary reservoir 4 then the printing system is shut down and the user is notified.

As is clear from a review of Cook, Cook does not disclose, teach or anticipate what is now claimed in amended independent claim 1. In particular, Cook does not anticipate an inkjet printing system configured for receiving a replaceable ink container having ink extraction characteristics that vary with ink extraction, with the printing system comprising an ink extraction determining device for determining ink extracted from the replaceable ink container, and a control device for selecting a print mode from a plurality of different print modes based on ink extraction characteristics of the replaceable ink container. In Cook, refilling the primary reservoir 4 from the secondary reservoir 10 does not require the controller 36 to select a print mode from a plurality of different print modes based on ink extraction characteristics of the replaceable ink container, as set forth in amended independent claim 1. In Cook, there is only a single print mode. Simply put, Cook does not disclose a plurality of different print modes with the use of a particular print mode being

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determined by ink extraction characteristics of the ink container. In Cook, the controller 36 simply determines when to refill the primary reservoir 4 from the secondary reservoir 10.

By adjusting the print mode based upon ink extraction characteristics, ink can be more fully extracted from the replaceable ink container while preventing ink starvation during printing. Because more ink is extracted from the ink container, the ink container does not need to be replaced as often, thereby reducing the per page printing costs of the printing system and reducing waste.

For the reasons set forth above, Applicants believe that Cook does not disclose, teach or anticipate, either implicitly or explicitly, what is now claimed by Applicants in amended independent claim 1. Hence, Applicants believe that the rejection of independent claim 1 under 35 U.S.C. § 102(e) has been overcome and should be withdrawn. Such action is respectfully requested.

Claim 9 has been amended and is now directed to an inkjet printing system having a printhead responsive to control signals for depositing ink on media and an ink delivery system for delivering ink to the printhead. The inkjet printing system comprises a monitoring and control device for monitoring ink delivered to the printhead by the ink delivery system, and for adjusting print rate during a print operation based on ink deposited on media and ink delivered to the printhead.

Quite simply, Cook does not teach, disclose or anticipate an inkjet printing system that includes a monitoring and control device for monitoring ink delivered to the printhead by the ink delivery system, and for adjusting print rate during a print operation based on ink deposited on media and ink delivered to the printhead, as now set forth in amended independent claim 9. In Cook, the rate of printing never changes. Cook at column 11, lines 5-45, sets forth that the controller 36 determines to refill the primary reservoir 4 from the secondary reservoir 10 prior to performance of a print operation. If the level of ink within the primary reservoir 4 is below a threshold value and the secondary reservoir 10 has insufficient ink to refill the primary reservoir 4 then the printing system is shut down. Clearly, this aspect of Cook does not constitute adjusting print rate during a print operation. Simply put, Cook does not disclose a monitoring and control device for

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adjusting print rate during a print operation based on ink deposited on media and ink delivered to the printhead, as set forth in amended independent claim 9.

Therefore, for the reasons set forth above, Applicants believe that Cook does not disclose, teach or anticipate, either implicitly or explicitly, what is now claimed by Applicants in amended independent claim 9. Hence, Applicants believe that the rejection of independent claim 9 under 35 U.S.C. § 102(e) has been overcome and should be withdrawn. Such action is respectfully requested.

Independent claim 16 has been amended to include language similar to that added to amended independent claim 9. As such, the arguments above directed to amended independent claim 9 are equally applicable to amended independent claim 16.

Therefore, for the reasons set forth above, Applicants believe that Cook does not disclose, teach or anticipate, either implicitly or explicitly, what is now claimed by Applicants in amended independent claim 16. Hence, Applicants believe that the rejection of independent claim 16 under 35 U.S.C. § 102(e) has been overcome and should be withdrawn. Such action is respectfully requested.

Dependent claims 2-8, 10-15 and 17-21 are directly or indirectly dependent upon amended independent claims 1, 9 and 16. As discussed above, it is believed that independent claims 1, 9 and 16 are now in a condition for allowance. Therefore, consideration and allowance of dependent claims 2-8, 10-15 and 17-21 is also requested.

CONCLUSION

In conclusion, it is believed that all claims 1-21 of this application are now in condition for allowance. A notice to that effect is respectfully requested.

Attached hereto is a marked-up version of the changes made to the specification and/or the claims by the current Amendment. The attached pages are captioned "**VERSION WITH MARKINGS TO SHOW CHANGES MADE**".

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CHARACTERISTICS

Any inquiry regarding this Amendment and Response should be directed to Kevin B. Sullivan at Telephone No. (858) 655-5228, Facsimile No. (858) 655-5859. In addition, all correspondence should continue to be directed to the following address:

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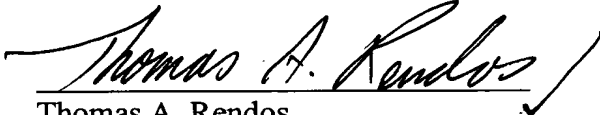
Respectfully submitted,

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CERTIFICATE UNDER 37 C.F.R. 1.8: The undersigned hereby certifies that this paper or papers, as described herein, are being deposited in the United States Postal Service, as first class mail, in an envelope address to: Commissioner for Patents, Washington, D.C., 20231 on this 18th day of March, 2002.

By 
Name: Thomas A. Rendos

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE



Applicant: Rory A. Heim et al.

Examiner: Michael Nghiem

Serial No.: 09/851,765

Group Art Unit: 2861

Filed: May 9, 2001

**VERSION WITH MARKINGS
TO SHOW CHANGES MADE**

Docket No.: 10006454-1

Title: METHOD AND APPARATUS FOR COMPENSATING FOR INK
CONTAINER EXTRACTION CHARACTERISTICS

AMENDMENT AND RESPONSE

Commissioner for Patents
Washington, D.C. 20231

Dear Sir/Madam:

This Amendment is responsive to the Office Action mailed December 27, 2001.
Please amend the above-identified patent application as follows:

IN THE SPECIFICATION

Please replace the paragraph beginning at page 4, line 22, with the following rewritten paragraph:

In one exemplary embodiment the replaceable ink container 12, receiving station 14, and inkjet printhead 16 are each part of a scanning carriage 20 that is moved relative to a print media 22 to accomplish printing. The printer portion 18 includes a media tray 24 for receiving the print media 22. As the print media 22 is stepped through a print zone, the scanning carriage 20 moves the printhead 16 relative to the print media 22. The printer portion 18 selectively activates the printhead 16 to deposit ink on print media 22 to thereby accomplish printing.

Please replace the paragraph beginning at page 5, line 7, with the following rewritten paragraph:

The ink-jet printing system 10 shown in Fig. 1 is configured to receive ink containers 12 having an ink extraction characteristics that vary with ink level in the ink container. These ink extraction characteristics in general vary with the size of the ink container 12. One exemplary ink extraction characteristic is a backpressure characteristic within the ink container 12. As ink is extracted from the ink container 12 the backpressure within the ink container 12 varies. This back pressure variation, if not properly compensated for in the printing system 10, can lead to a variety of problems for the printing system 10. These

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problems include reduction of print quality due to excessive backpressure, reduction of printhead reliability due to air ingestion and increased stranding of ink in the ink container 12, to name a few problems.

Please replace the paragraph beginning at page 11, line 7, with the following rewritten paragraph:

The receiving station 14 includes a guide rail 46, an engagement feature 48 and a latch engagement feature 50. The guide rail 46 cooperates with the guide rail engagement feature 40 and the replaceable ink container 12 to guide the ink container 12 into the receiving station 14. Once the replaceable ink container 12 is fully inserted into the receiving station 14, the engagement feature 42 associated with the replaceable ink container engages the engagement feature 48 associated with the receiving station 14, securing a front end or a leading end of the replaceable ink container 12 to the receiving station 14. The ink container 12 is then pressed downward to compress a spring biasing member 52 associated with the receiving station 14 until a latch engagement feature 50 associated with the receiving station 14 engages a hook feature 54 associated with the latch member 30 to secure a back end or trailing end of the ink container 12 to the receiving station 14. It is the cooperation of the features on the ink container 12 with the features associated with the receiving station 14 that allow proper insertion and functional interfacing between the replaceable ink container 12 and the receiving station 14. The receiving station 14 will now be discussed in more detail with respect to Fig. 4-5.

Please replace the paragraph beginning at page 12, line 28, with the following rewritten paragraph:

Fig. 6 is a bottom plan view of the replaceable ink container 12 of the present invention. The replaceable ink container 12 includes a pair of outwardly projecting guide rail engagement features 40. In the preferred embodiment, each of these guide rail engagement features 40 extend outwardly in a direction orthogonal to upright side 70 of the replaceable ink container 12. The engagement features 42 extend outwardly from a front surface or leading edge 72 of the ink container 72 12. The engagement features 42 are disposed on

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either side of an electrical interface 74 and are disposed toward a bottom surface 76 of the replaceable ink container 12. The electrical interface 74 includes a plurality of electrical contacts 78 electrically connected to an electrical storage device 80.

Please replace the paragraph beginning at page 13, line 28, with the following rewritten paragraph:

The handle portion 44 disposed on a top surface 86 at the trailing edge 82 of the replaceable ink container 12. The handle portion 44 allows the ink container 12 to be grasped at the trailing edge 82 while inserted into the appropriate bay of the receiving station 14.

Please replace the paragraph beginning at page 15, line 12, with the following rewritten paragraph:

Fig. 9 represents a block diagram of the printing system 10 of the present invention shown connected to an information source or host computer 90. The host computer 90 is shown connected to a display device 50 92. The host 90 can be a variety of information sources such as a personal computer, work station, or server to name a few, that provides image information to the controller 29 by way of a data link 94. The data link 94 may be any one of a variety of conventional data links such as an electrical link or an infrared link for transferring information between the host 90 and the printing system 10.

Please replace the paragraph beginning at page 15, line 20, with the following rewritten paragraph:

The ink container 12 shown in Fig. 9 includes the electrical storage device 80 and three separate ink supplies representing the tri-color ink container 12 shown in Fig. 6. When properly inserted into the tri-color receiving bay 58 fluid communication is established between each of the separate ink supplies or chambers and one or more inkjet printheads 16.

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Please replace the paragraph beginning at page 17, line 25, with the following rewritten paragraph:

In one exemplary embodiment, the capillary storage member is a bi-component fiber having a polypropylene core material and a polyethylene terephthalate sheath material. This bi-component fiber is described in more detail in U.S. Patent Application 09/430,400 entitled "*Ink Reservoir For An Inkjet Printer*," Attorney Docket No. 10991407, filed October 29, 1999 to David Olsen, Jeffrey Pew, and David C. Johnson, and assigned to the assignee of the present invention.

Please replace the paragraph beginning at page 18, line 13, with the following rewritten paragraph:

At a constant extraction rate of 1 cubic centimeter per minute of ink from the ink container 12, the dynamic backpressure represented by curve 100 reaches the maximum operating backpressure 102 when approximately 27 cubic centimeters (see dashed line 104) is extracted from the ink container 12. Further extraction of ink from the ink container 12 beyond the maximum operational backpressure at the extraction rate of 1 cubic centimeter per minute will result in loss of print quality. The technique of the present invention allows the extraction characteristics to be used to adjust the ink extraction rate to prevent operation of the printing system 10 beyond the maximum operational backpressure. In the exemplary embodiment, the extraction rate is reduced from 1 cubic centimeter per minute to .25 cubic centimeters per minute to allow ink to be further extracted from the ink container 12. At the extraction rate of .25 cubic centimeters per minute, the maximum operational backpressure represented by curve 102 is not reached until approximately 35 cubic centimeters (see dashed line 106) are extracted from the ink container 12. By adjusting the extraction rate of ink from the ink container 12, eight additional cubic centimeters of ink can be extracted from the ink container 12 as represented by the difference between the ink extracted at .25 cubic centimeters per minute and the ink extracted at an ink extraction rate of 1 cubic centimeters per minute.

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Please replace the paragraph beginning at page 19, line 19, with the following rewritten paragraph:

The technique of the present invention, allows ink to be extracted from the ink container 12 at a given extraction rate. The extraction rate can be reduced upon the occurrence of an appropriate condition for reducing the ink extraction rate from the ink container 12 so that more ink can be extracted from the ink container 12. One such condition for adjusting the extraction rate is when the backpressure within the ink container reaches a threshold backpressure value such as maximum operational backpressure. Alternatively, the ink extraction rate from the ink container 12 can be reduced when a threshold amount of ink is extracted from the ink container 12. The ink extraction rate is then ~~produced~~ reduced so that a greater amount of ink can be extracted from the ink container 12.

Please replace the paragraph beginning at page 20, line 13, with the following rewritten paragraph:

The ink container is first inserted into the printing system 10 as represented by step 108. Upon insertion, the controller 29 reads the extraction characteristics or lookup table that is stored in the electrical storage device 80 associated with the ink container 12 as represented by step 110. The controller 29 then determines the amount of ink remaining in the ink container 12 as represented by step 112. The amount of ink remaining in the ink container 12 is either stored on the electrical storage device 80 associated with the ink container 12 or alternatively, the controller 29 keeps track of the amount of ink printed for determining the amount of ink remaining in the ink container 12. For the case where the controller keeps track of the amount of ink printed, this information can be stored back on the electrical storage device 80 so that the electrical storage device 80 contains information for determining the amount of ink remaining in the ink container 12.

Please replace the paragraph beginning at page 21, line 5, with the following rewritten paragraph:

The monochrome ink container, such as shown in Fig. 7 will in general have different ink extraction characteristics from the tri-color ink container shown in Fig. 6. The

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monochrome ink container has a larger portion within the reservoir 34 and therefore will have different backpressure characteristics as ink is extracted than ~~and~~ the much smaller chambers within the reservoir 34 associated with each ink color in the tri-color ink container 12. For this reason, the lookup table associated with the monochrome ink container 12 will have different values from the lookup table associated with the tri-color ink container 12.

IN THE CLAIMS

Please amend claims 1, 3, 4, 6, 7, 9-17 and 19 as follows:

1. (Amended) An inkjet printing system configured for receiving a replaceable ink container, the replaceable ink container having ink extraction characteristics that vary with ink extraction, the inkjet printing system comprising:
 - an ink extraction determining device for determining ink extracted from the replaceable ink container; and
 - a control device for selecting a print mode from a plurality of different print modes based on ink extraction characteristics of the replaceable ink container.
2. The inkjet printing system of claim 1, wherein the control device selects the print mode for selectively pausing printing to reduce an average ink usage rate.
3. (Amended) The inkjet printing system of claim 1 wherein ~~the control device selects the print mode from a plurality of print modes with each~~ print mode of the plurality of different print modes ~~has having~~ a different pause value associated therewith.
4. (Amended) The inkjet printing system of claim 1 wherein ~~the print mode is selected from a plurality of print modes;~~ the plurality of different print modes includes a first printing mode with a first usage rate and a second printing mode with a second ink usage rate different from the first usage rate.

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5. The inkjet printing system of claim 1 wherein the replaceable ink container has ink extraction characteristics that vary with the ink level within the replaceable ink container.
6. (Amended) The inkjet printing system of claim 1 wherein the replaceable ink container has a gauge pressure characteristic based on ink usage which varies with ink level within the ink container.
7. (Amended) The inkjet printing system of claim 1 wherein ink extraction characteristics are stored on an electrical storage device associated with the replaceable ink container, wherein the electrical storage device defines the ink extraction determining device, and wherein the ink extraction characteristics are provided to the control device after installation of the replaceable ink container into the inkjet printing system.
8. The inkjet printing system of claim 7 wherein the information storage device is a semiconductor storage device.
9. (Amended) An inkjet printing system having a printhead responsive to control signals for depositing ink on media and an ink delivery system for delivering ink to the printhead, the inkjet printing system comprising:
a monitoring and control device for monitoring ink delivered to the printhead by the ink delivery system, and ~~and~~
~~a control device~~ for adjusting print rate during a print operation based on ~~an~~ ink deposited on media and ink delivered to the printhead.
10. (Amended) The inkjet printing system of claim 9 wherein the monitoring and control device adjusts print rate based on a rate of ink deposited on media and a rate of ink delivered to the printhead.

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11. (Amended) The inkjet printing system of claim 9 wherein the monitoring and control device determines ink delivered to the printhead based on ink extraction characteristics of an ink container.

12. (Amended) The inkjet printing system of claim 11 wherein the monitoring and control device determines an amount of ink delivered to the printhead over a given time interval based on an extraction rate for an ink container that is determined based on ink remaining in the ink container.

13. (Amended) The inkjet printing system of claim 9 wherein the monitoring and control device adjusts print rate to prevent the print rate from exceeding a rate of ink delivered to the printhead by more than a threshold value.

14. (Amended) The inkjet printing system of claim 9 wherein the monitoring and control device adjusts print rate by selectively pausing printing to reduce an average print rate.

15. (Amended) The inkjet printing system of claim 9 wherein the monitoring and control device adjusts print rate by selectively controlling numbers of nozzles activated.

16. (Amended) A method for operating a printing system having a printhead and a supply of ink separate from the printhead, the method comprising:

determining ink flow from the printhead;

determining ink flow into the printhead; and

adjusting a print rate during a print operation if the ink flow from the printhead exceeds ink flow into the printhead by a threshold amount.

17. (Amended) The method claim 16 wherein the determining ink ~~flows~~ flow from the printhead is based on drop counting.

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18. The method of claim 16 wherein the determining ink flow into the printhead is based on ink extraction characteristics of the ink container.

19. (Amended) The method of claim 18 wherein the determining ink ~~flows~~ flow into the printhead is based on ink level within the ink container.

20. The method of claim 16 wherein the adjusting the print rate is selectively inserting a pause between successive print swaths to reduce an average print rate for successive print swaths.

21. The method of claim 16 wherein the adjusting the print rate is selectively limiting the number of nozzles activated on the printhead.